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# West Europe Report

SCIENCE AND TECHNOLOGY

No. 164

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WEST EUROPE REPORT  
SCIENCE AND TECHNOLOGY

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## ADVANCED MATERIALS

### FRG ANNOUNCES FIVE-YEAR MATERIALS RESEARCH PROGRAM

Frankfurt/Main FRANKFURTER RUNDSCHAU in German 10 Sep 83 p 13

[Text] As in the United States, Japan, and France, the FRG will now also have a specific material research program. Federal Research Minister Heinz Riesenhuber announced in Bonn that such a program is to be started effective 1 January 1985 initially for a term of 5 years. The minister estimated the required funding at at least DM50 million per year. Looking at industrial projects, plans call for a subsidy rate which probably "will not exceed 50 percent" but which will rather be below that figure (presumably around 40 percent). Here again, the idea is to allow conditionally repayable subsidies. Riesenhuber wants to get the funds by cutting back in other parts of his budget.

The new material research program supposedly is aimed not only at promoting "highly innovative" undertakings which go far beyond the state of the art now but also at a definite output increase in relevant material properties, such as strength, temperature and corrosion resistance, as well as magnetic and electrical properties. The following among others are to be promoted: Interdisciplinary overlapping projects (basic research--applied research--industrial development) in a few selected sectors with emphasis on structural ceramics, powder metallurgy, metallic high-temperature working materials, composite materials and special polymers (with special electrical, electronic, optical, mechanical, and thermal properties).

As Riesenhuber explained in this connection, the topic of material research over the past 3-5 years has been gaining more and more international attention. The possibility of broadening the frontiers of that which is technically feasible--assuming the engineers can get suitable working materials--was investigated in widely differing areas and that includes auto-making and micro-electronics. The scientific aspects supposedly are so considerable that no export-intensive, highly-industrialized country can afford to continue to neglect this research field. The FRG could to some extent already offer some excellent research results in this field (for example, ceramic engine parts).

The crucial point here now is to work together across the board, to summarize that which is going on in the special research sectors of the German research community, and to include that which is happening in basic research in the Max-Planck Society and then to match all of this up with the technical problems which industry, for example, is struggling with.

5058  
CSO: 3698/437

## OTRAG ROCKET FIRM COOPERATES WITH ESA IN LAUNCH

Munich SUEDDEUTSCHE ZEITUNG in German 22 Sep 83 p 56

[Article by editorial staff member Rudolf Metzler: "The Flying Saul Is Allowed to Shoot Again. The Obscure Rocket Company 'Otrag' Has Rectified Itself Into Being a Partner of European Astronautics Research"]

[Text] With a deafening din Otrag (Orbital Transport and Rocket Joint-Stock Company) of Munich broke the silence which it had imposed on itself for 2 years after encountering powerful political headwinds. The launch of a 5.8-meter-long module with two payload containers on board did not take place--as did the last launch--in Zaire or Libya, but from the Esrange launching pad of ESA (European Space Agency) 40 kilometers north of the Swedish city of Kiruna, which is located about 300 kilometers from the North Cape.

The surprising transformation of a political scapegoat which wanted and intended to make possible the production of weapons carriers for such controversial regimes as Mobutu's or Khadhafi's, into a partner of European space research did not happen overnight. If the Stuttgart rocket designer Lutz T. Kayser had not given up Otrag's top managerial post the new launch would not have been possible. It's true that astronautics professor Eugen Sanger's student had the ideas for the rocket construction system by means of which satellites and other payloads were to be launched into earth orbit less expensively than is possible using the high technology preferred by the space powers, but, carried away by his not exactly modest evaluation of himself, he counted his chickens before they were hatched. The carelessness and political naivete with which he established himself in crisis-racked regions eventually resulted in massive domestic and foreign pressure and the end of his dubious African adventure.

His successor, the former Otrag press chief and later technical director Frank K. Wukasch, an engineer, at least followed a different strategy after taking over management of the company. He saw in the only European rocket launching pad in Sweden the chance to try out the concept of the bunching of rocket engines. Wukasch explained after the surprising new launch north of the Arctic Circle: "We don't want to take the third step before the second, as has been the case up to now. We therefore considered that the right thing to do was to use our system for high-altitude research rockets first, as was done in Kiruna in order to investigate the upper atmosphere."

Still Wukasch managed to join up not only with the ESA but also with the DFVLR (German Research and Testing Institute for Air and Space Travel), which is commissioned by the Federal Government to coordinate all German astronautical activities and is thus something like the German NASA. It provided launch dates for Otrag's test launches. For the protection of the population "shooting" could take place only between 7 am and 3 pm daily. At times the operation had to stop altogether on account of the Lapps' guaranteed hunting rights within the radius of the launching pad. In addition, DFVLR put its mobile launching platform at Otrag's disposal. The Munich rocket men, who were accustomed to a broad shooting range from their tests in Zaire and Libya, eventually had to get used to significant restrictions and tightened security precautions in northern Sweden.

After holding out for 3 weeks for good launching weather things finally got going last Monday. Strong winds had blown the fog and low-lying clouds away, although they were still almost thick enough to prevent the launch. The countdown proceeded without a hitch and liftoff occurred smoothly and exactly at the planned time of 7:59 am Central European Standard Time. The Otrag launch was also a first for Esrange: this was the first launch of a liquid-fuel rocket.

It's true that the West German rocket men got a surprise two and a half seconds after the engine stopped firing. The payload consisted of two experiments provided by the professorship for space technology at Munich Technical University and the Aachen Institute of Technology, active in the same field. The Munich people had provided a mass spectrometer, while the westerners wanted to try out the transmission of a video signal from the upper atmosphere. During this experiment "aeroacoustic phenomena," as the scientists put it, occurred at one and a half times the speed of sound and prevented the return parachute from opening.

The launch test itself went "down the tubes," as the DFVLR technicians put it. Instead of the predetermined altitude of 33 kilometers an altitude of only 17 kilometers was reached. The rocket technicians, who had travelled to the launch site from Garching in the Munich district, had the consolation that their carrier was "exactly on course."

Otrag chief Wukasch likewise hopes to stay on course after contracts with DFVLR permit him further launches. Currently in Garching one propulsion unit per month is being produced, and 10 are ready for further launch tests. The next goal is the testing of a two-stage rocket with a launch-weight payload of 250 kilograms, which would achieve the capacity of the "Skylark," the high-altitude research rocket which has been launched frequently from Kiruna.

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CSO: 3620/11

## NEW TOP-OF-THE-LINE ENGINE FOR RENAULT

Paris L'HUMANITE in French 23 Sep 83 p 12

[Article by Jacques Moran]

[Text] Despite its success with the R9 and R11, Renault did not have all the ingredients necessary to fulfill all its European and American ambitions. Europe's most coveted line lacked a gasoline engine worthy of the name, capable of competing with the best. At last, they've done it. The R11 GTX, TXE AND TXE Electronic are equipped with a 1,721 c.c. 82 horsepower engine with an overhead camshaft - something new for Renault.

The old "Cleon forged" engine with push rods and lifters (first installed in the R4 . . . in 1961), allowed Renault to sell the most economical cars in the world. Not very powerful and too noisy, its limitations became apparent, however, in the R9 and the R11, while the great European automakers (especially PSA) were developing engines worthy of the 80's.

The new "F2N" engine is built in Cleon in a new, 80 percent automated factory estimated to have cost 1.6 billion francs.

Renault management says their goal was to create an engine with low-speed torque and consequent versatility, rather than power, without sacrificing fuel economy (an average of 6.9 liters compared to 7.03 for the R11 TSE equipped with a 1,897 c.c.). Maximum torque (13.9 mkg) is reached at 3,250 rpm, but remains at 12 mkg between 1,500 and 5,000 rpm.

The R11, and soon the R9, finally has an engine worthy of it, even if the "F2N" is still a little noisy. Renault's frontrunner could climb in the "upper middle" line, provided it's competitive with the R18. In any case, the "F2N" has a promising future: the cylinder volume and power can be increased at will and engineers have already designed the turbo-charge system.

The difference in price between the TXE and the TSE is 1,200 francs. A five-door TXE, then, should cost 63,700 francs (61,800 for a three-door), a GTX 58,500 francs (56,600 for a three-door) and a TXE Electronic 69,600 (67,700 francs for a three-door), all equipped with a new, exclusively top-of-the-line engine.

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CSO: 3698/43 (2)

MICROELECTRONICS

DEVELOPMENT PLAN FOR FRENCH INTEGRATED CIRCUIT RESEARCH GROUP

Issy-les-Moulineaux L'ECHO DES RECHERCHES in French No 112, 2nd quarter 1983  
p 61

[Article by Michel Camus: "CNET Grenoble Research Program Being Governed by Long-Range Developmental Plan"]

[Text] The CNS [Norbert Segard Center]--the CNET [National Center for Telecommunications Studies] center at Grenoble, specializing in research on silicon IC's [integrated circuits]--has now reached the end of the first period of its existence. This period has been characterized by an extensive and very rapid growth and by the installation of extremely important facilities in a very short time. But it has also been characterized by the attainment of initial results in the different domains in which the center has developed its activities, whether these have involved:

--The design of IC's (development of new design tools, such as the CASSIOPEE [expansion unknown] system; design of innovative circuits, particularly the PROTEUS [expansion unknown] signal processing circuit, etc);

--Basic research on fundamental technologies (in the domain of annealing and recrystallization of silicon, for example, which has made it possible to design stacked transistors);

--The simulation and modeling of devices and technologies (development of the TITAN [expansion unknown] and JUPIN [expansion unknown] programs);

--Means of characterization (ellipsometry) and machines involved in the fabrication of circuits;

--Circuit manufacturing process control (BASIL [expansion unknown] system).

Its accomplishments in these undertakings indicate that, from the standpoint of technology, the CNS has come of age. Its level of competence and of credibility is confirmed by its mastery of a 3-micron NMOS [n-channel metal oxide semiconductor] technique which it itself developed, in accordance with the objectives set for it at the time it was created.

All in all, the CNS is thus today an operational research center, equipped with a vast array of facilities, which owes it to itself to deliver to the nation, in the years to come, concrete results that are commensurate with its mission. To keep it from dispersing its efforts and to enable it to resist the temptation to cover the entire silicon microelectronics domain (for, this domain is extremely vast and its possible avenues of research innumerable), the management of the CNET asked the CNS to draw up a long-range developmental plan, bearing in mind that the credibility of the CNET Grenoble stands or falls on the success or failure of its industrial technology transfers, and that advanced technologies must be provided to French industry to enable it to recapture the electronics sector.

After a period of brainstorming and discussions in which all the personnel of the center were involved, the CNS submitted to the CNET management a long-range developmental plan that takes into account the present situation of the CNET Grenoble, the considerableness of IC needs in the telecommunications sector, objectives that need to be attained in silicon microelectronics under the major guidelines of the Electronics Sector Program, and the intent affirmed by the minister of PTT to contribute most actively to the carrying out of this program.

The developmental plan sets forth the CNS's objectives and the research programs it will undertake over the next 4 years. Following are its main outlines as finally approved by the CNET:

The CNS's primary objective is to develop, by the end of 1986, a transferable technology at the level of the leading technologies at that time. This technology, which is to be of the CMOS [complementary metal-oxide semiconductor] type, must enable the actualization of circuits specific to telecommunications, that is, integrating system-protective functions, signal processing functions and software functions. Its characteristics must be defined by mid-1983, but it can already be stated as of now that, for the production of the necessary logic components, the CNS will be making use of the submicronic techniques that only the utmost-performing microlithographic machines of that moment in time can make possible. The choice of circuit to be used to validate this technology--and which could be, for example, a circuit for a telephone line or a video encoder--will also be stipulated prior to mid-1983.

To attain this year-end 1986 objective, an intermediate objective has been set up, consisting of the development, by the end of 1984, of a logic CMOS technology producing circuit-line widths as small as 1.5 microns, that is to be validated by a circuit: A  $32 \times 32$  switching matrix operating at over 34 Mbits/sec (complexity around 17,000 transistors).

Activities external to the primary objective, research for the post-1986 period, or direct end-use studies, must not involve more than 20 percent of the center's personnel resources. Such end-use studies include particularly innovative circuit design studies.

Lastly, the plan stipulates that the CNS shall conduct its research in close liaison with external organizations, especially the LETI [Electronics and Data Processing Technology Laboratory, Grenoble]. Coordination between the LETI and CNS programs could go so far as to divide studies between these two organizations as regards basic techniques. Similarly, prior to mid-1983, the CNS must define the bases of a cooperation with industry that will enable the transfer of the CNS's results, particularly its 1986 technology.

The tasks that are to lead to the year-end 1984 intermediate objective, then to the year-end 1986 primary objective, have been defined, integrated and interrelated as a very detailed program in the form of a PERT [Program Evaluation and Review Technique] diagram.

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## MICROELECTRONICS

### FRENCH INVESTMENT IN, STATUS OF INTEGRATED CIRCUITS PLAN

Paris LE MONDE in French 22 Sep 83 p 34

[Article by Eric Le Boucher: "Integrated Circuits Plan: Self-Sufficiency and Profitability Not Just Around the Corner"]

[Text] What is the status of the Integrated Circuits Plan? "Chips," the core of electronics technology, have been the focal point of diligent action on the part of our government authorities. Their production now pivots about two poles--Thomson and MATRA [Mechanics, Aviation and Traction Company], in alliances with the subsidiaries of foreign groups. The strategy has been defined and the world market is on the rebound. Conditions are favorable, provided...there be no lack of public money.

The goals the public authorities have set for themselves with respect to integrated circuits, according to the Electronics Sector Action Plan" (which covers the years 1982-1986), are many: Righting of our trade balance, regaining of our technological self-sufficiency, creation of 1,000 additional jobs. On the whole, the idea was to continue the efforts that were undertaken in 1978 (first components plan), correcting them, however, and, above all, shifting them "into high gear."

Convinced that without integrated circuits the entire French electronics industry would crumble, the new government realized that the 1978 plan had its merit, a not insignificant one: The creation of two new French plants, namely, MHS [Matra-Harris Semiconductors], a subsidiary of MATRA to the extent of 51 percent and of the American firm Harris to that of 49 percent, on the one hand, and EUROTECHNIQUE [expansion unknown], a subsidiary of Saint-Gobain (51 percent) and of the American firm National Semiconductor (49 percent). These two new plants were added to the Thomson ones and to those of the foreign groups: RTC [Radioteknique Compelec] (a Philips subsidiary), Texas Instruments, Motorola, and SGS [General Semiconductors Company] (an Italian government-owned group). However, the rapid growth of the French market widened the gap between demand and production. Projections on which calculations had been based, and the irresistible rise in imports, made it clear that "our shots had fallen short." To rectify our trade balance and, moreover, recover a relative technological self-sufficiency would require the pouring of much more money into this industry.

The second plan, published in March 1982, stated that the national effort for the period 1982-1986 would require "additional funding, in view of the past trend of the 1978-1982 plan," in the amount of 3.4 billion francs for R & D [research and development] and 2.2 billion francs for industrial investments. The state would have to absorb around two-thirds of the expenditure on research and find privileged financing for the investments. For the year 1982, government subsidies to research would have to total 480 MF [million francs], after which there would have to be an "upping of subsidies." What is now, 18 months later, the status?

In 1982, government subsidization reached a ceiling of 400 MF; this ceiling was then upped to 700 MF for this year. This rate, if continued at constant francs, conforms (though just barely) to the blueprint for R & D. But it will not suffice for this morbidly capital-hungry industry. More than 1 franc has to be invested to produce 1 franc of additional revenue. "The subsidies allocated to research are not large enough; we are constantly running short of funds," explains the head of one firm. French and foreign production in France, which amounted to 1 billion francs in 1982<sup>1</sup>, must rise to 4.6 billion francs in 1986 at constant francs (the size of the market by then). As regards French production itself, Thomson (which includes domestic plants, its subsidiary EFCIS [Special-Purpose Integrated Circuits Design and Manufacturing Company], and Eurotechnique, acquired from Saint-Gobain, which the government "took out" of electronics) must increase its output from 370 MF in 1982 to 2 billion francs. MHS must go from 50 MF in 1982 to 1 billion francs in 1986. The overall difference of 2.6 billion francs--in other words, more than just the 2.2 billion francs provided for by the plan--must be financed. No indication has been forthcoming as yet from the government authorities as to where this money is to come from, if not through reinvestment or loans.

Actually, part of R & D subsidization serves to finance investments. This is one of the factors leading to confusion. There is, however, a second one, stemming from the capital grants and participative loans made to the public enterprises (in 1982, 1.5 billion francs to Thomson, but nothing to MATRA), in that part--an unknown part--of this money is reinjected into components activities.

One is thus reduced to estimates for lack of exact figures. The government has probably disbursed around 1 billion francs this year for integrated circuits (700 MF in research subsidies and around 300 MF in transferred capital grants). There is no comparison between this sum and the previous government's outlay (150 MF per year), but it is still less than the amount deemed necessary by the plan (1.2 billion francs per year for 5 years).

It is all the more so in that the 150 MF Thomson was to receive for the take-over of Eurotechnique have not yet been credited to it. They are to be included as part of a package of 1983 special budgetary credits that Mr Delors's services are, for the time being, rejecting.

In the face of these budgetary problems, Messrs Lagardere and Gomez, the presidents of MATRA and Thomson, have tended to pause questioningly. Their questions are understandable, and all the more so in that their integrated circuit operations are producing continuing deficits. In 1982, losses ran close to 150 MF for EFCIS, 100 MF for Thomson's specialized divisions, and 120 MF for Eurotechnique (totaling 370 MF for the Thomson group) and around 60 MF for MHS. Such "holes" had been expected, and there is nothing alarming about them in this very difficult industry.

#### Buy French?

Many doubt that the Japanese groups have as yet turned profitable, despite 10 years of effort and their 30-percent share of world production. When one notes that they reinvest over 25 percent of their revenue<sup>2</sup>, one can better grasp the level of difficulties that characterize this industry and can understand the hesitations of "little" producers like Matra and Thomson. The Schlumberger group has already sunk \$1.5 billion into getting its subsidiary Fairchild back on its feet, and success still eludes its grasp... Nevertheless, Mr Lagardere and Mr Gomez appear to be wanting to accept the challenge. The right strategy remains to be found.

As the government authorities see it, only one strategy is possible: The circular flow. It consists of producing, on a top-priority basis, the chips needed by the French users, in exchange for a commitment from the latter to veer toward the French chip-production poles. A sort of interactive support between one and the other, leading to a reorientation of high-prioritized production toward the so-called "linear" circuits, which are widely used in the consumer electronics sector (television, hi-fi, etc)<sup>3</sup> and in the automotive sector, which in the very near term will become a "bearer" market. Thomson should be the French pole for the linears, alongside of SGS (which will be subsidized), RTC and Motorola. Next, for "digital" circuits, the idea would be to base production on the telecommunications, professional electronics and data processing sectors, requesting these sectors to "buy French."

The putting into effect of this circular-flow strategy runs into a different viewpoint on the part of many heads of enterprises, who would buy French only under conditions of equal quality and price. This is the case at Thomson, where they balk at doing any favor whatever for an in-house colleague. Hence, the wrangling both in-house and with the government authorities... Even more necessary, and perhaps better based, given the current decentralized management structures of the large groups, is cooperation among the "teams" on the developing of new components--in short, a circular-flow strategy in the future rather than in the present. MHS and CIT-ALCATEL (telephone) could join each other in inventing new chips, while Thomson could improve in-house joint operations and go into ULA's [uncommitted logic array(s)]. This R & D-based circular-flow strategy would work better. But it is far from being perfect, in that certain group divisions would remain too isolated.

Thus, with the help of the "decentralized management" principle, the course being followed is toward a "semi-circular flow." MHS and Thomson will, of course, develop some new products, but the bulk of their output as of 1986 will still be integrated circuits from which the trademarks of their American partners--Motorola and National Semiconductors for Thomson; Harris, Intel and possibly the Japanese NEC for MHS--will have been more or less removed. But that is not the essential handicap. From the standpoint of product design, France with its engineers can close any gap.

The principal risk of the plan is technological: One must know how to manufacture at low cost. In this industry, which borrows a bit from chemistry, a bit from solid-state physics, a bit from optics and a lot from the silicon cookbook, "know how" evolves so rapidly that being "at the cutting edge" one year in no way guarantees being there a year later. Integrated circuits is an industry "with an almost zero-error margin of profitability."<sup>4</sup> In other words, a 5-percent loss of yield with respect to a single Japanese or American competitor means a 5-percent loss of clear profit. In this arduous technological race, success depends on having good teams and state-of-the-art equipment. It would be essential, therefore, that Thomson refrain from perturbing the engineers of the recently acquired Eurotechnique's Rousset plant. As for equipment, France and even Europe lack it. This was the entire stakes in the conflict that pitted the staffs of Mr Gomez against those of Mr Chevenement with regard to CAMECA [Company for Mechanical Applications to Electronics, Cinema and Atomistics] this winter.

This Thomson subsidiary wanted to abandon its equipment activities because of an agreement MATRA had signed with the American manufacturer GCA, and the Ministry of Industry opposed this abandonment. Today, CAMECA appears to have put its principal research efforts warmly and snugly to bed.

To succeed, one must also manufacture memories. The race being run is, in fact, based on this particular type of ubiquitous circuit. Memories are the "driving force" of the technology which is then applied everywhere else to more specific and highly profitable products. Memories must therefore be manufactured in France under license, even if it means "losing our shirts on it," is the unanimous affirmation of all the specialists. In plain language, this means we cannot avoid stepping, with both feet, into the costly worldwide free-for-all between the Japanese and the Americans. Half-measures are out of the question.

Under these conditions, and since France is handicapped by its small size and its delay in getting started, it appears evident that neither technological self-sufficiency nor profitability will be "tomorrow-morning" things. But if all goes well, if advantage can be taken of the economic recovery that is starting to get under way, even though it has not yet made its appearance in France, and, above all, if the state continues its outlays at the necessary level--which remains to be seen--then the French will definitely be there the day after tomorrow.

#### FOOTNOTES

1. The total revenue for the sector was 1.8 billion francs in 1982, according to the Federation of Electrical and Electronics Industries. But this includes some 800 MF of trades or paid studies.
2. The cost of production equipment, which is becoming more and more complex, is rising at the rate of 25 percent a year, and, for the most part, it must be renewed every 3 years.
3. Hence the importance attached to the acquisition of Grundig by Thomson, a project which, as is known, was aborted.
4. The reason for this is mathematical: Chips are not made one by one, but rather in batches (in the form of a wafer that contains several hundred chips side by side). If only one of the chips is good, its cost becomes that of the entire wafer. If only two are good, that cost is divided by 2, etc. For a given type of circuit, if one gets, for example, 100 good chips per wafer, and a competitor gets 110, the competitor can reduce his selling price worldwide by 10 percent, inducing losses of 10 percent for all his competitors. Hence a technological race in which France is not in the lead. This is particularly true insofar as concerns wafer diameters. The larger they are, the greater is the yield. France is currently working with diameters of 4 inches, while the Americans, already at 5 inches, are going over to 6-inch diameters.

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CSO: 3698/28

## SCIENTIFIC AND INDUSTRIAL POLICY

### FRG MINISTRY FOR RESEARCH, TECHNOLOGY 1984 BUDGET DETAILS

Munich MARKET & TECHNIK in German 2 Sep 83 pp 6, 8, 10

[Text] Bonn (he)--According to Federal Research and Technology Minister Dr Heinz Riesenhuber, it is the federal government's goal to improve the general conditions for industrial research and development in the GDR. Additional and effective incentives are to be created for research and development activities by stepping up indirect promotion measures, such as tax benefits. This article presents a breakdown of the 1984 BMFT [Federal Ministry of Research and Technology] budget.

According to Research Minister Dr Heinz Riesenhuber, the federal government pursues a research policy whose goal it is to improve the general conditions for industrial research and development in the FRG. These general conditions include the following, among others:

External contract research capacity and technology transfer, especially from universities, government research institutes, and government-promoted association research;

Technology and innovation advisory services, especially for small and medium enterprises;

Information possibilities on scientific and technical developments, especially through technical information systems and patent documentation;

Licenses and patents from government-promoted research and development;

Equipping enterprises with in-house capital and activation of private risk capital;

Well-trained supply of young natural scientists and engineers.

The 1984 research budget and medium-term finance planning until 1987 are designed step by step to express the federal government's change in attitude in this policy area which is so decisive for the future--it says in the August 1983 issue of the BMFT journal. The 1984 BMFT budget volume, with the 30

individual plans, comes to DM7.126 billion as compared to 6.919 billion in 1983. The 3-percent increase rate is above the increase rate for the entire budget and has also been included in medium-term finance planning. The major expenditure blocks in the budget (Figure 1) have been changed in varying degrees:

Institutional promotion is to be increased by a total of 3.6 percent to a figure of DM2.5 billion. The biggest item in institutional promotion consists of DM1.28 billion for large-scale research installations. This signifies an increase of 3.1 percent. For the big sponsor organizations of research institutes outside universities, the MPG (Max-Planck Society) and the FhG (Fraunhofer Society), subsidies were raised by 4.9 percent to a total of DM 497 million; 388 million are available for MPG and DM 190 million are available for FhG.

Subsidy sector (including research installations grouped by main points)	1984 budget in million DM	Share out of total BMFT budget
Energy research and technology	2,788.4	39.1%
Research and technology for raw material supply, working material development, water research	225.2	3.2%
Ocean research and technology, polar research	171.7	2.4%
Innovation promotion (including DM82 million indirectly-specific)	83.5	1.2%
Physical technologies: Production engineering (including DM40 million indirectly-specific)	100.0	1.4%
Electronics (including DM150 million indirectly-specific)	291.0	4.1%
Data processing (GMD)	58.8	0.8%
Space research and technology, including DFVLR without aviation share	810.0	11.4%
Aviation research and technology, including DFVLR share	178.3	2.5%
Research and technology in the service of health, nutrition, and environment	510.2	7.2%
Humanization of work place	100.0	1.4%
Transportation and traffic technologies, construction research	258.0	3.6%

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Subsidy sector, including research installations	1984 budget in million DM	Share out of total BMFT budget
Technical communication, information technologies	150.8	2.1%
Information and documentation	73.8	1.0%
General research promotion	605.8	8.5%
Physical-chemical basic research	669.9	9.4%
Administration	510.0	0.7%
Sum, 1984 BMFT budget	7,126.4	100.0%

Figure 1. 1984 BMFT budget program outline. GMD--Society for Mathematics and Data Processing; DFVLR--German Research and Development Institute for Air and Space Travel. Source: BMFT Journal.

Around DM570 million will be available in 1984 for investments in the entire institutional promotion sector. This is an increase of 14.9 percent compared to 1983. One essential reason for this is to be found in the big projects in basic research, such as the HERA (Hadron-Electron Ring Plant) for the exploration of elementary particles at DESY (German Electron Synchrotron) in Hamburg.

The international contribution obligations are to go up by 3.5 percent to a figure of DM687 million. Here it is necessary in part to keep up with the higher price rises abroad. The share of 9.6 percent out of the BMFT budget however clearly shows that German R&D policy still has a very high opinion of multinational cooperation. The biggest shares in this area consist of the contribution to the ESA in Paris with DM383 million and the CERN with DM208 million in Geneva.

The 1984 budget contains a total of DM3.912 billion for project promotion. This is a drop of 0.6 percent compared to 1983. In the light of past experience, about DM2.2 billion will go to R&D projects in industry out of that amount, while DM639 million will go for reactor financing; the rest (DM1.1 billion) will be made available to research inside and outside universities.

It is probable that more than DM31 billion will be spent in 1984 for R&D activities in industry. Of that amount, DM1.3 billion will be covered by indirect research subsidies, compared to 0.66 billion in 1981. In the opinion of Research Minister Dr Riesenhuber, this means that the boost in indirect promotion measures creates additional and effective incentives for R&D activities in industry. Because almost 70 percent of the German research expenditures are being made in industry, this sector presumably is of decisive importance for the development of research results.

Tax benefits are said to be an essential instrument for indirect research promotion here but do not constitute the comprehensive aspect here. Figure 2 shows the structure of 1981-1984 research expenditures in order to explain the contributions from the federal government and, here again, those of the individual ministries to the entire research expenditures in industry.

6 Gesamte Förderung ziviler FuE an Unter- nehmen der ge- werblichen Wirtschaft Bund (BMFT)	7 FuE- Personal- zuschüsse an kleine und mittle- re Unter- nehmen	8 For. <sup>1)</sup> derung des Wiss- sens- und Tech- nolo- gie- trans- fers	9 zu 2) keinen Zielun- gen	10 Indirekt; <sup>3</sup> spezifi- che För- derungs- maß- nahmen	11 Son- derab- setz- ungen (bis 1974)	Zulage §4 Inv. ZuG	12 Summe = Indirekte und indirekt- spezifische Förde- rung von FuE in der gewerbli- chen Wirt- schaft	13 14 Verhältnis Indirekte : di- rekte Förde- rung von FuE
	Mio DM	Mio DM	Mio DM	Mio DM	Mio DM	Mio DM	Mio DM	
1974	1295 (1209)	—	—	—	220	133	353	1 : 3,7
1975	1721 (1470)	—	—	—	—	149	49	1 : 11,6
1976	1525 (1253)	—	—	—	—	106	106	1 : 14,4
1977	1594 (1424)	—	1	1	—	153	155	1 : 10,3
1978	1930 (1664)	—	5	2	—	138	145	1 : 13,3
1979	2466 (2117)	300	9	4	—	169	482	1 : 5,1
1980	2491 (2111)	355	16	11	—	191	573	1 : 4,3
1981	2713 (2315)	361	20	4	—	289	674	1 : 4,0
1982	3475 (3141)	390	22	6	90	—	300 <sup>5)</sup>	1 : 4,3
1983	2738 <sup>4)</sup> (2500)	350	23	13	150	210 <sup>5)</sup>	300 <sup>5)</sup>	1 : 2,6
1984	2778 <sup>4)</sup> (2500)	350	57	24	190	350 <sup>5)</sup>	300 <sup>5)</sup>	1 : 2,2

1) Externe Vertragsforschung + Technologietransfer + WT aus GFE + Volontärplätze; 2) WFG + TOU; 3) Mikroelektronik + Fertigungstechnik; 4) Schätzung BMFT; 5) Schätzung BMFT  
Stand: 4.7.1983

Figure 3. Indirect and direct research promotion, 1974-1984. Key: (1) External contract research plus technology transfer, plus WT [share] from GFE [large-scale research outfits?] plus voluntary spaces; (2) WFG [science research community?] plus TOU [expansion unknown]; (3) Microelectronics plus production engineering; (4) BMFT estimate; (5) BMFT estimate; 6--Direct promotion of civilian R&S to enterprises in industry, federal BMFT; 7--R&D personnel allowances to small and medium enterprises; 8--Promotion (1) of science and technology transfer; 9--Risk financing (2); 10-- Indirect (3) specific promotion measures; 11--Special depreciations (until 1974); 12--Subsidy according to Article 4, Investment Subsidy Law; 13--Sum = indirect and indirectly-specific promotion of R&D in industry; 14--Ratio between indirect and direct promotion of R&S; 15--For R&D investments; Mio--Million. Status as of 4 July 1983.

Ca. 70 percent of German research projects are done in economics. They developed as follows:  
Research and Development in Economics

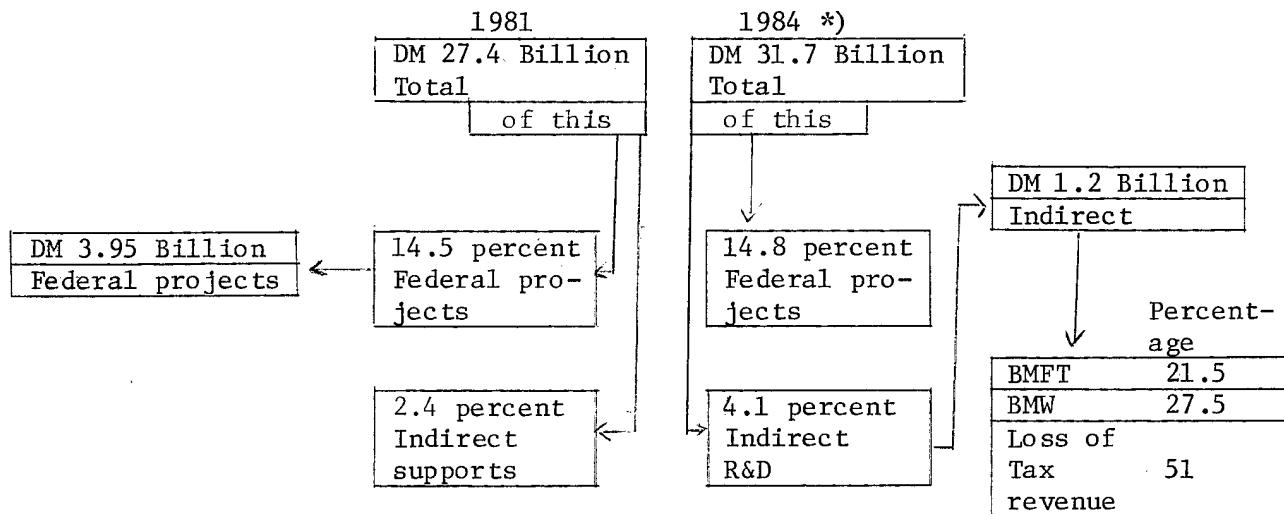


Figure 2. 1984 research expenditure structure compared to 1981.

The 1984 BMFT budget allocates DM272.3 million for indirect research promotion; this is an increase of 45.9 percent. The emphasis here, in addition to the planned continuation of the special microelectronics program, above all resides in the increase in funds for external contract research which went up by 190 percent to a figure of DM40 million and for which continually rising amounts have been earmarked (1985: DM47 million, 1986: DM60 million, 1987: DM70 million). Another main point resides in a new indirect promotion program in the field of production engineering. Here, plans call for DM350 million to be made available over a period of 4 years in order to promote the use of industrial robots in this industry branch in the equipment supply industry. This new indirectly specific promotion measure is to start in 1984 with DM40 million.

The total indirect research promotion volume to be handled by the federal government will come to about DM1.272 billion in 1984. By way of supplementation of the BMFT measures, this is achieved through the personnel cost subsidy program of the Federal Economy Ministry (DM350 million), the allowance proposed in the budget of the Federal Finance Ministry according to Article 4 of the Investment Allowance Law (DM350 million), and the possibility of special depreciations for R&D investments which was reintroduced by the federal government.

This relief for the economy will lead to an estimated tax revenue drop of DM350 million. The ratio between indirect research promotion and direct research promotion accordingly will in 1984, as compared to 1981, be improved further in favor of indirect promotion. Details can be seen in Figure 3.

The promotion of key technologies also shows increases "where, preserving competition in realistic market research to face the international challenge, more cooperation is necessary in tackling fundamental scientific-technical problems." To push the development effort, the subsidy funds for biotechnology will go up by 11.1 percent to a figure of DM70 million, by 10.0 percent to DM27.5 million for optical communications technology, by 6.4 percent DM50 million for information processing, by 9.8 percent to a figure of DM35.7 million for nonmetallic raw materials, and by 4.1 percent to a figure of DM63 million for technical communications.

Cutbacks are made in sectors where the status of research and technology so permits and where the market and the users as well as agents of development can be boosted. This applies to communications satellites where funds were cut by almost 41 percent down to a figure DM68 million as a result of the fact that the Post Office became involved in the financing and for the sector of efficient energy use and new energy sources. This subsidy volume has been cut by 21.5 percent to a level of DM188 million because most of the research work has been done.

As part of its action possibilities, the BMFT is trying to help solve the problem of training young scientists. The training program of the Large-Scale Research Installation Community is being continued. The target here is to hire 600 new scientists on a temporary basis, for at most 3 years, in each case, within 3 years. A 5-year promotion program of the BMFT is being started this year; as part of that program, about 20 scientists in the field of biotechnology will be sent abroad with the help of an annual expenditure of DM1 million. The 1984 budget finally for the first time provides an amount of DM5 million so that it will be possible to promote technological key and growth sectors through the employment of qualified young scientists in research institutions. A total of DM30 million has been earmarked for this purpose until 1986.

5058  
CSO: 3698/437

SCIENTIFIC AND INDUSTRIAL POLICY

FRG'S KRUPP BUILDS LARGEST POLYESTER-MAKING PLANT IN USSR

Dusseldorf VDI NACHRICHTEN in German 16 Sep 83 p 35

[Article signed Kp: "Large-Scale Plant Produces Polyesters: 3rd Materials Factory in USSR Using Dynamit-Nobel Process"]

[Text] A plant designed to produce annually 120,000 metric tons of DMT of (dimethylterephthalate) was recently placed in operation by the Mogilev Fiber Combine 600 kilometers southwest of Moscow. DMT is a material for the production of polyester, which is worked into continuous threads for use in the textile industry. The plant is the largest of its kind in the USSR. Two plants in the same combine with annual capacities of 54,000 and 60,000 metric tons of DMT have been operating since 1975 and 1980.

The new plant was built by Krupp Koppers of Essen and consists of 7 basic stages: 2 distillation stages, 2 crystallization stages, 2 reaction stages, and a common stage for the supply of production agents and materials. These are housed in the DMT main building, occupying an area measuring 30 by 200 meters. A tank depot, on land also measuring 30 by 200 meters, supports the production routine.

Several improvements have served to increase the new plant's chemical efficiency by 2 percent over that of older DMT plants: process technology improvements; structural optimization of equipment, towers and reactors; and thermal recycling of residues. Also, total energy consumption was lowered by 15 to 20 percent by combining users and by heat-recovery techniques. Moreover, the plant was designed in such a way that the percentage of metal oxide and hydrocarbons contained in the flue emissions is lower. The purity of the emissions meets the German TA air standards.

The production facility is controlled and supervised from a central control room. This DMT plant is the first to be equipped with a process data information system from Krupp Atlas Elektronik in Bremen, a system that optimizes energy consumption and the efficiency of materials production. Three process computers operate the system: an EPR 1300 computer for logging process data, a second computer of the same type

as the main frame, and an EPR 1100 computer for the video process display. The computers serve to ascertain the optimal routine by constantly coordinating and recording up-to-the-minute production data.

There are also three color monitors that display the plant's flow diagram with current test data and actions such as test runs.

Together with the process-donor Dynamit Nobel in Troisdorf, Krupp Koppers leased the license and supplied the know-how for the plant, directed the process design, basic engineering and detailed engineering, supplied equipment, supervised the construction and directed the trial operations. Due to the experienced personnel in the fiber combine and their excellent collaboration, production satisfied specifications and performance was certified as meeting contract stipulations.

This plant increases Soviet DMT production based on the Dynamit-Nobel process to over 300,000 tons per year.

[picture caption] With the acquisition of the 3rd facility for producing dimethylterephthalate, the source material for all-synthetic fiber, the USSR now produces annually over 300,000 metric tons by the Dynamite-Nobel process. The newest plant, belonging to the Mobilev Fiber Combine and having a capacity of 120,000 metric tons per year, is located 600 kilometers southwest of Moscow.

9992  
CSO: 3698/14-E

SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

KRUPP POLYETHYLENE FACTORY TO USSR--Fuel tanks for automobiles are being fabricated increasingly from synthetics (polyethylene). Krupp-Kautex Maschinenbau [Machine Construction] of Bonn is one of the leaders in the development and construction of equipment for producing these tanks. Several of this company's extrusion blow-molding facilities are successfully producing synthetic fuel tanks in the FRG and in foreign countries, principally in Western Europe. A further step is now being taken to introduce these tanks: a first complete tank-producing facility, valued at more than 10 billion marks, is being supplied to the Soviet Union. The machines will be assembled in Togliatti by 1984/85 and annually produce 250,000 fifty-liter tanks, each weighing 5.5 kilograms net, for the new Lada passenger car. The contract also calls for tool development, a recycling unit for re-use of waste material, finishing facilities for drilling, milling and heat sealing, laboratory and test instruments, and personnel training. [Text] [Dusseldorf VDI NACHRICHTEN in German 29 Apr 83 p 46] 9992

CSO: 3698/14-E

TECHNOLOGY TRANSFER

EUROPE, U.S. DIFFER ON RESTRICTING HIGH TECHNOLOGY IN COCOM

Hamburg DIE ZEIT in German 14 Oct 83 pp 33-36

["Dossier" article by Wolfgang Hoffmann, assisted by Erwin Brunner and Ulrich Schiller: "The Secret Club of Cocom"]

[Text] In Paris, eastern trade is being watched by 16 western controllers. America is pushing them to intensify the ominous Cocom proscriptions. Is the German business with Russia in jeopardy?

Paris, rue La Boetie 58a. The American Embassy is a few minutes away. The French President's Champs-Elysees and the Elysee Palace are not far either. No 58a is a puny building, but behind its walls important things are happening.

Early October, on a Friday, two to three dozen people are coming out of that house: representatives of the 15 most important western industrial countries. Most of them, the Europeans, are hurrying to Charles de Gaulle airport; they want to go home for the weekend. That includes the Germans, who had come from Bonn. Their last plane, LH127, takes off for Cologne at 1955 hours.

On other days in the week the lights in rue La Boetie are switched off late at night. It has been very busy in recent weeks and months, and it will be equally busy in the weeks and months ahead. In the summer of 1984 at the latest, important decisions will have to be made. It is all about the technical supremacy of the capitalist world.

Rue la Boetie 58a, a building that is part of the American Embassy, is occupied by one of the most important command centers of the western world. A sort of secret war is being directed from there, a peaceful war, to be sure, which yet is effective. Goods that otherwise stream unimpeded through world trade from west to east are being watched from here succinctly, controlled, directed and proscribed as well. Even the name of the center in the heart of Paris sounds much like a code term: CoCom.

CoCom, an abbreviation, stands for Coordinating Committee for East-West Trade Policy. That sounds innocuous enough and suggests a breakfast get-together. Yet what CoCom is dealing with these days is anything but innocuous. If the western world is going to curb its eastern trade significantly, as the American members of CoCom demand it should, it will be a heavy blow against the still most important industrial branch in the FRG. Alexander Batschari, spokesman

of the German Machine and Plant Construction Association, has said: "If the hawks prevail, we might as well close shop."

A case in point: Some in German machine construction now are placing their export chances on the new textile machines under electronic controls. Those devices are much wanted in the East Bloc. Its machines of yesterday are successively being replaced by new modern machines. Computerized machinery can, however, also be used for purposes other than knitting and weaving, cutting out and finishing textiles. Helmut Giesecke, chief of the foreign commerce department of the German Chamber of Industry and Trade in Bonn has said: "With such modern automation there is no way of avoiding ultimately its being used for missile-warhead guidance systems. If CoCom intervenes to the extent that even textile machines first have to be tested for their harmlessness, it will become extremely tough for the trade by German firms." "Tough" is but a discreet way of saying: Nothing will sell anymore.

#### Bonn's Secretiveness

To the FRG, eastern trade--5 to 6 percent of total foreign trade--is not such a big deal, to be sure. For some branches, however, it is more of a deal. The machine tool sector always exports circa 10 percent of its production to the Soviet Union alone. "That is quite a portion," says Alexander Batschari. For some companies the portion might still be larger. There are firms exporting 50 percent of their output to the East Bloc. They have much to lose in Paris.

Negotiations have been going on since 1981 and intensified since the Versailles economic summit last year. There, the state and government chiefs of the seven most important western industrial nations committed themselves: "We have agreed to take a reasonable and differentiated approach in trading with the USSR and Eastern Europe, in conformity with our political and security policy interests. This includes improving the international control system for the export of strategic goods to those countries." At this year's summit meeting in Williamsburg the declaration was a bit more formal--wholly in the spirit of the host, U.S. President Ronald Reagan.

Such diplomatic and nonobligatory formulations are to be made binding and hardened at CoCom, and this behind closed doors. A veil of secrecy has always been spread over CoCom. Seeing nothing, hearing nothing, saying nothing--is the motto there. Ministerial Counselor Joachim Daase of the Bonn Ministry for Economics originally was willing to lift the veil of secrecy, even if only a little. After checking with his superiors, he repealed that promise. His reason: "secrecy regulations."

Even less uptight German CoCom officials who think the secrecy ritual is silly talk only under the conditions that no names are mentioned. There is, however, also still a very simple reason for the special taciturnity in Bonn: the change in Bonn. Some in Bonn's official hierarchy seem not quite accustomed yet to their new bosses in Bonn. Keeping your mouth shut is better than talking too much. You can never know what is up. In any case, there is not other way to make sense of such reticence. Last summer, parliament was still briefed publicly on CoCom--by State Secretary Martin Gruner of the Ministry for Economics, which can be found in the proceedings for the 106th session of the Bundestag.

## At the Edge of Legality

Granted, those in Bonn are not the only ones having a hard time with the transparency that is so understood in democracies. The U.S. Embassy in Paris even refuses to say where the CoCom members regularly meet: "No comment." And yet, CoCom is not all that secret either.

There is however a good reason why one does not like to talk about these matters in all countries belonging to CoCom: CoCom is an organization at the edge of legality. Wherever the FRG is a member of important international organizations, especially of such that make binding decisions, those organizations are officially recognized by those national parliaments that ratify the relevant accords. That is not the case with regard to CoCom. CoCom is informal; it commits no one to anything and yet obligates the participants more than is the case in decisions taken by other, recognized, international bodies. CoCom is effective.

The Coordinating Committee is a child of the Cold War; despite being meanwhile 33 years old, it cannot deny its origin. Founded in 1950 upon U.S. insistence, it is a year younger than the Atlantic Pact. Founding members were, along with the United States, Great Britain, France, Italy, Belgium, the Netherlands and Luxembourg. The FRG, Denmark, Canada, Norway, Portugal, Greece, Turkey and Japan joined later. With the exception of Iceland, all NATO states are members. The permanent seat of this informal circle is in Paris. The head of the German delegation is the Bonn Ambassadorial Counselor Bruno Spengler in Paris, telephone 00331/3593351, extension 344.

The secretariat of the CoCom center is relatively small, has only a dozen permanent yet highly qualified associates. The annual budget is not exactly abundant at DM 1.5 million (Bonn pays 160,000), which makes it hardly bigger than the travel budget for a classical Bonn ministry, as CDU Bundestag deputy Willy Wimmer of Neuss has complained. Having acquired the reputation of a Cold Warrior in his party, he considers such financial dowry deplorable.

Yet Willy Wimmer is not likely to have ever looked into CoCom's working procedure. The point is that thus far the secretariat has always received subsidies whenever necessary--as during the last year and a half. One meeting after another. More interpreters were needed, more part-time personnel also. Finally, a revision of CoCom is pending; the circle's efficacy is to be enhanced, boycott is to be forged into a sharper weapon.

At all that, CoCom only is the terminal, now the first and then the final control point to secure the Western technical lead. For the rest, CoCom resolutions are handled by the competent foreign trade authorities in the member countries, in the FRG, by the Federal Office for Industrial Economics in Eschborn/Frankfurt.

CoCom in Paris is the brain trust that draws up the lists for technical goods, methods and know-how considered as most ticklish so that their export to the east is supervised accurately and, if need be, prevented. They meet every week at rue La Boetie in Paris. Experts from the member countries are drawn in, as the situation requires, helping the embassy personnel detailed to CoCom. That often includes industrialists with security clearance and committed to secrecy. Once or twice a year there are so-called high-level meetings. Then ministerial official of the department chiefs' echelon go to Paris. From Bonn comes Helga

Steeg, ministerial director and head of the foreign economic policy department of the Ministry for Economics. These meetings set the general CoCom guidelines and decide where to tighten up and where to slacken the reins.

From its activity, CoCom has drawn up three different production lists: a military and a nuclear one and one for commercial industrial commodities that can be used in civilian as well as military life. In this third list, the potential military-strategic use functions as the crucial criterion for the CoCom controllers. Different from the general ruling out eastern exports of goods on the first two lists, the third lists deals only with export restraints for certain goods of strategic importance.

Whatever decision is taken at CoCom in Paris, unanimity is its supreme principle. That also is the reason why it sometimes takes long for CoCom to come out with new provisions. That is to say, strictly speaking it is not CoCom that issues the provisions; rather it is the national governments that insert the CoCom decisions in the national foreign economy laws. The FRG government is entitled to do that. CoCom resolutions become German law by decree. Thus the three CoCom lists are also available in the currently valid German version, in the "48th decree on the amendment for the export list, appendix AL to the foreign economy decree."

This export list sets down what the FRG economy may and may not export to the east. Goods on this list, in principle, require official export licenses. This release ticket must be purchased from the Federal Office for Industrial Economics in Eschborn. Either the officials themselves decide what the rule is or they pass the export application on to Bonn, to the FRG Ministry for Economics. That usually is the case when the exporter applies for exceptional authorization. If it then involves military or nuclear products on the German lists A and B, such an application is useless. But if it involves a product or product group on the German C list (other strategically important goods), an export application is not for all intents and purposes futile.

In conformity with the volume of the planned export to the East Bloc, the Economics Ministry, together with the Foreign Ministry and the Defense Ministry, examines whether the export can be considered compatible with foreign policy interests and security policy guidelines. CoCom rules allow less ticklish exceptional authorizations to be issued by a national government alone, with CoCom reserving the right to subsequent examination.

Important exceptional authorizations however have to be discussed and decided on within CoCom. Between 1977 and 1980, CoCom approved 777 German applications at a total value of \$ 147 million. State Secretary Martin Gruner has said: "In that period that came to circa 15 to 20 percent of all applications granted in CoCom."

Along with drawing up the lists and passing on exceptional authorizations, the supervision of agreements is CoCom's third main field of work. As the Committee, however, is only informal and sanctions cannot be taken against members that have committed a violation, one has to rely on mutual trust. The only basis for CoCom thus is its members' moral obligation to abide by the jointly prepared rules of the game.

There is unanimous agreement among the CoCom experts in science, politics and economics that the CoCom business has functioned well in the past. No violations are known for which any national foreign trade authorities could be blamed. There is however a grey zone which even CoCom does not have under control: the frequently successful attempts East Bloc countries are making at acquiring western techniques the criminal way, mainly through smuggling and espionage.

#### Agents, Smugglers, Racketeers

At an oceanic techniques conference in Moscow, an expert invited from the West gave a paper. That was first completely harmless; problematic, however, became the several hours of discussion which the Soviet attendants clearly pitched at enticing from the expert from the West seemingly harmless remarks about the military applicability of oceanic techniques.

Here one has to know that in this sector the Soviet Union is lagging behind the West for several years. In view of the ever increasing development of data and information networks in the western world, the East early recognized, for instance, that a low-risk opportunity exists for obtaining technical-scientific data. Wherever international organizations have data banks and information networks, the East Bloc states have become busy. For example, IIASA (the International Institute for Applied Systems Analysis) at Laxenburg near Vienna has long been a Soviet target. The institute, which also employs high ranking technicians from the east, maintains contacts with western computer centers but also with the institute for applied systems analysis in Moscow.

Often, to be sure, getting western know-how, the export to the east of which is strictly forbidden by CoCom regulations, is very much simpler. Integrated circuits, on the CoCom index, can be bought without any trouble at any well stocked hobby shop in western countries. A connoisseur of the scene from the Siemens firm has said: "You can take it for granted that eastern diplomats take suitcases stuffed with such materials home with them or send it home by diplomatic pouch."

That such "purchases" sometimes then also include products and techniques which become part of the East Bloc's arsenals, is to be taken pretty much for granted. Heinrich Vogel, director of the Federal Institute for Eastern and International Scientific Studies in Cologne, thinks that because of the variety of manifestations of modern technology and the, in principle, open exchange of goods and information among western industrial corporations illegal transfer cannot be fully ruled out.

At a CoCom seminar sponsored by the Friedrich Ebert Foundation, Vogel, who knows the matter well, quoted figures: "The current estimate of the proportion of illegally transferred western technology in new Warsaw Pact military developments comes to circa 70 percent."

The Americans think they know still better. More than 150 eastern weapons systems, including also the SS20, were based on western technology, as was stated in May this year by Richard Perle, the director responsible for international security in the U.S. Defense Department, the Pentagon.

Roughly 20,000 Soviet agents--the CIA reports--are launched as buyers, smugglers and spies to get the latest western equipment to the east. Soviet methods are said to be highly sophisticated. For example, radar expert William Bell was arrested in 1981 after having sold 20 pieces of documentation to an agent of the Polish firm Polamco which has subsidiaries in Illinois and Delaware; according to the CIA, he delivered radar data for the F15 fighter bomber, the B1 and the Stealth bomber, radar systems for tanks and for anti-aircraft rockets.

According to the intelligence report, the Soviet Union and other East European countries in the 1970's set up 30 firms in America and 300 in West European countries to get their hands on important military technology through them. Such firms can simply just purchase such interesting commodities and study them quietly. As long as they export neither the equipment nor the data, they do not even infringe American control legislation.

But not only Eastern agents are roaming around in the illegal transfer of technology, quite a number of racketeers and profiteers from the West are too. Since the Americans shifted to a higher gear in their export policy after the Soviet invasion of Afghanistan, computers and microelectronics equipment have more and more frequently gotten to the East in the criminal way, not so rarely via the FRG:

--Graduate engineer Werner J. Bruchhausen is said to have sold to the East Bloc illegally computer equipment at a clip of DM 30 million which is on the CoCom list. His American companion already got a 5-year prison sentence in the United States. In September this year, the prosecutor's office in Duesseldorf indicted Bruchhausen for violating the foreign economy law and the economics criminal law. These are offenses calling for 3 to 5 years in prison.

--The dealings of electronics dealer Freddie Schiavo blew up when the police got the hunch that he purportedly wanted to smuggle, through his Elmont AG firm, four computers at a value of over DM 1 million to the Soviet Union, via Switzerland. The Federal prosecutor in Karlsruhe is prosecuting Schiavo and his partner on the grounds of suspicion of "intelligence activity."

--The Luebeck public prosecutor is investigating businessman Richard Mueller of Jesteburg. He purportedly smuggled several computers on the CoCom index to the East via Switzerland and the FRG after he had, innocently, bought a share of an organ building firm in Moelln.

The computer smugglers always use the same mesh. Through a ramified network of firms the equipment first gets imported "legally" from the United States and then gets smuggled to the East, through mailbox companies and camouflage addresses, provided with forged delivery documents. In the FRG alone, CIA Director William Casey told FRG Economics Minister Count Lambsdorff last year, there are 150 companies and individuals involved in the illegal transfer of technology to East Bloc states.

The U.S. government has tried for some years to curb the illegal East-West trade. The U.S. Commerce Department keeps a confidential Economic Defense List of firms that received penalties or lost their export privilege. "To stop the

smuggling to foreign countries of highly developed technical equipment for military purposes," so says William von Raab, head of the U.S. Customs Administration, an "Operation Exodus" was started in the fall of 1981: In cooperation with European customs officials, the U.S. searchers have meanwhile confiscated some 1,400 illegal shipments at a value of nearly DM 200 million. At the Williamsburg summit meeting, Ronald Reagan committed FRG Chancellor Kohl to keeping a close eye on infringements of the CoCom regulations.

#### The FRG as the Turnstile?

FRG investigation authorities now seem to have been committed to strict secrecy. In June this year, for instance, Duesseldorf's top finance management in a press conference had still quite frankly talked about what it had been dealing with: Illegal transfer of technology had rapidly increased lately; the FRG had become a turnstile for smugglers of computers; regular shopping lists were being received from Moscow; there were cases that were so explosive they did not even become public knowledge. Then "reprimands were given" for so much frankness--and now the prosecutors had buttoned up.

Information cannot be obtained about the number of contraband cases exposed nor about how explosive the problem is from the Customs Crime Institute in Cologne, the central headquarters for customs violations: "This is a highly political matter." An extreme concession to the secrecy obligation: "Cases like these already occurred 20 years ago. But the tendency is growing now, and for 2 years we also have paid much more attention to this area." Not surprising. The Germans can hardly hope to attenuate the American CoCom policy if time and time again cases become public which demonstrate that the fears of the Americans are not so very much off the mark.

The customs attache of the U.S. Embassy in Bonn, Viktor Jacobsen, has little respect for his government's reproaching the FRG for having meanwhile become the transshipment spot for sensitive technical commodities: "Sure, there may have been some cases, but then the German customs stopped them. Very much more is being shipped through other countries." Granted, industrial countries were more suitable for illegal technology transfer than developing countries. "If Upper Volta orders 20 computers, you become suspicious at once, but if an FRG firm orders that many computers, it is perfectly normal."

Far more skeptical still are the military in Washington. They report, e.g., that a U.S. firm that makes the hard cores for tank ammunition by chance discovered one day that the lathes from the FRG also were shipped to the Soviet Union. In other cases, computer chips were bought in the United States, allegedly to be used in the FRG, but then they were sent to Austria and from there, to the Soviet Union.

The neutral countries, Switzerland, Austria and Sweden which, being neutral, do not belong among the CoCom states, seem especially suspicious to the American CoCom strategists. The "Favag Case" in Switzerland, a case of smuggling of the usual variety, came just in time for the Americans: Since the illegal computer business became exposed (early this year) the firm was served a tentative embargo from the Commerce Department; U.S. authorities loudly ventilated whether to put Switzerland on the list of countries that should not receive any strategically ambiguous commodities; the Austrian were told of that affair as the reason why a subsidiary of AMI (American Microsystems International) in Graz was refused the import of special machines from its U.S. parent company.

Meanwhile the Americans have let themselves be reassured again. Only in August this year Switzerland took legal precautions to prevent the illegal export of strategic materials to the East. "Many devices," so said an official in the Swiss Federal Office for Foreign Economy, "are subject to legal provisions equal to the requirements on the CoCom list." Also, "Switzerland is a country through which goods that are under CoCom control cannot more easily get to the East than from the CoCom countries themselves."

The AMI plant in Austria has meanwhile also received a shipping license. Bruno Kreisky, then still chancellor, and his State Secretary Ferdinand Lacina were able to convince the Americans after several conversations that Austria has enough control devices to prevent the feared transfer of strategically important goods to the East.

To keep new animosities of this sort from running rampant again, the United States and Austria have established a "permanent contact" for ironing out discrepancies at once. With all their regard for the interests of U.S. firms there are, however in Austria "no control listings which could in any way be compared with the CoCom list."

Bloc-free Finland seems not to have attracted any suspicion at all as yet, however. An analysis of its trade balance indicates conspicuously, however, that it is among the countries that have considerable export surpluses in trading with the Soviet Union because of the sale of so-called "sensitive goods" (building devices, electronics, special ships). Furthermore, Finland is the third most important supplier of Moscow. Japan and the FRG occupy spots one and two. Especially during the last 2 years, while the East-West trade warfare intensified, Finnish exports to the Soviet Union increased considerably.

All these happenings in the eastern trade, be they legal or illegal, keep inducing the Americans to curb technology transfer via CoCom still more and stop it as much as possible. SPD deputy Ulrich Steger, the economy and technology expert of his fraction, is afraid "we will finally land, like the Soviet Union, in a wartime economy where all production becomes secret. Then we lose not only the strength we have had up to now in the contest between the systems, the openness that is, we also interfere with corporate innovation capability by barring the free access to technology and its utilization."

Altogether the Americans easily misperceive that along with official export controls there are still others that are much more effective. "Unofficial watchdogs" is what the U.S. CoCom expert Angela Stent calls the exporting corporations' own interest in not ruining their future markets by delivering the up-to-date technologies too early. Says one computer expert of Siemens: "We do pay great attention to what we are shipping and what the importers can do with it. It simply is a totally wrong notion to think one of our computers could be used, without ado, for military purposes if its software is programmed for a baking factory. And furthermore, in case of any departure from the purpose, we would find out fast since we service our products regularly."

What with the rapid technological advances, it would seem to make sense to enlarge the list of products that need to be kept secret, so that the West would go still below the CoCom activities during the Cold War in the 1950's. Then the

lists were much longer than they are today. Nearly 300 product groups were on the index in 1951. Meanwhile the number has dropped to 150. The German weapons list has 22 product groups, the nuclear list 23 and the list for other goods, 102.

It sounds as if it is not much yet it is. Each and every product group has a large number of subgroups. Figure 0009, for instance, deals with the CoCom export ban for "war ships and special naval equipment." The explanations then detail all that belongs to it: precise specifications of the types of ships and other equipment all the way to painstakingly described electrical motors, compasses and underwater nets. Figure 1564 deals with the export ban for "electronic components." Then we get nine columns listing the various products concerned. The descriptions deal with hundredths of nano seconds (billions of seconds), temperature fluctuations between extreme minus to extreme plus, frequencies at powers of tenths and more.

CoCom does accept the principle that embargo resolutions must be unanimous. But when it became tough to get such unanimity because of greatly differing interests, the right of the stronger would often prevail in the past. With that, the Germans have had bitter experiences. In 1962/63, for instance, during the Cuban and Berlin crises. After the Americans had attempted in vain to enforce in CoCom an anti-Soviet embargo on large-diameter steel tubing, they put pressure on their most faithful and dependent ally, the FRG. FRG Chancellor Konrad Adenauer forbade three German firms--Mannesmann, Hoesch and Phoenix-Rheinrohr--the deliveries of 163,000 tons of large tubes already ordered. The British then finally transacted that business.

But they too sometimes were left holding the bag. In 1970, the British firm ICL (International Computer Limited) wanted to export a large computer to the Soviet Union. The Americans demanded a strict export ban from the CoCom commission which was turned down by the other members because the American demand was militarily unjustified. So the Americans applied their leverage elsewhere. Gunnar Adler-Karlsson, a CoCom expert of the Vienna Institute for International Comparative Economics, describes what happened: "According to reliable reports, the American representatives in CoCom hinted to the Europeans opposing the U.S. demands, mainly the FRG and England, the United States might impose a computer embargo." This might have made it impossible for the governments, as previously, in 1964, the De Gaulle government, to get IBM computer equipment, on which they frequently depended. That then had been the main reason for Great Britain and the FRG to accept the U.S. position.

Apart from such spectacular events, CoCom did not play much of a role up to the late 1970's. The number of banned goods dropped gradually. Under the auspices of detente, trade was seen as a device for drawing the Soviet Union into the international division of labor. A turning point came late in 1979, when the Russians invaded Afghanistan. Whereas the Europeans, much more dependent altogether on trade than the United States with its own domestic market, first tried for business as usual, the Americans insisted on applying the export brake sharply. In line with the new export control law the Pentagon was charged with preparing a list of "militarily critical techniques." This list is being re-examined every year because the Reagan administration is afraid more and more technical commodities with civil as well as military applicability (dual use technologies) could get into the East Bloc.

This turn of events had already been adumbrated in the summer of 1978. Because of the human rights violations in the Soviet Union, the then President Jimmy Carter decided on spectacular sanctions against Moscow. He forbade the U.S. firm Sperry Univac to export a Univac 1100 computer the Soviets had ordered for the press center for the 1980 Olympic Games in Moscow. This national U.S. decision also became an official concern in CoCom because the question arose who could now fill the order. The Americans insisted on solidarity, yet that can only be, according to CoCom rules, if it involves militarily important commodities, which was about the last thing one could say about the Sperry computer. Carter rescinded the export ban again in the spring of 1979, and the firm got its export license back. A German computer specialist comments: "That's the way it has lately often been with the Americans, unfortunately. First one thing, then the other. You never know what you are up against."

The crises in Afghanistan and, later, in Poland gave a lift to those forces in Washington that strictly oppose the transfer of any kind of technology. For instance, there is Lawrence Brady, undersecretary of state in the U.S. Commerce Department. His credo runs like this: "The western leaders, however, must also demonstrate to the Soviet Union their determination to prevent western technology and its resources to be used by the enemies of western ideals for undermining the social, political and economic objectives of the pluralistic democracies."

Brady complains that "the economic detente, which is likely to have provided the Soviets with a genuine interest in acquiring western goods and techniques, has not been able to arouse in the Soviets a genuine interest in moderating their revolutionary and expansionist conduct. On the contrary: To the extent that the technical strength of the Soviets increases, they ever more clearly aim their designs on expanding their political and military influence farther than ever before."

In the FRG, such hawks can be found only in the right-wing spectrum of the Union parties. One of them is the CDU Bundestag deputy Herbert Czaja, who said: "Without adequate concessions by the Soviet Union in substantial peace and historic issues, the transfer of technology only strengthens the Soviet Union's infrastructure, supplies and raw material capacity, helping it in releasing capacities for its armaments."

The ideological trailblazer for such ideas is a former high-ranking economic functionary of the GDR, Werner Obst. This man, after making a volte-face, contends, for instance, the natural gas pipeline business would from 1985 on net the Russians a foreign exchange income of DM 25 billion annually. Says Obst: "The natural gas business thus decides whether Soviet technology imports remain what they are and thus lose in importance, relatively speaking, or can be pushed up further." Defense Minister Manfred Woerner follows the same line. His apprehension is this: "Otherwise we get into an area which Lenin once outlined this way: The west will supply us with the ropes by which we shall hang it."

That it will ever come to that is most unlikely, however. Although the Soviet Union has bought plenty technical commodities in the west during the last decade, it continues to be vastly behind in the civilian-industrial sector: between 5 and 7 years. According to an IFO survey among German traders with the east, it takes much longer in the Soviet Union than in western countries to absorb the

technical principles of new foreign installations. Even for copying single machines a time requirement of at least 5 years was observed. Copying complex systems requires up to 10 years.

Scientist Juergen Noetzold of the Science and Policy Foundation in Ebenhausen in a much noted study comes to the conclusion that a partial embargo would hurt the Soviet Union in specific civilian-technical sectors, to be sure, but would not likely to have any noticeable effects on its armaments technology. Noetzold's explanation sounds plausible: The Soviet economy is oriented to main efforts in which some branches are pushed in a target-directed manner. One main effort goes to arms. Autarky is a demand. No superpower can afford to rely on the delivery of foreign technology. The point Noetzold underscores is this: "Not even CoCom could keep the Soviet Union from turning into a military superpower." Space travel is a similar story. After all, the Soviets preceded the Americans in space, and this by means of a home-made technology.

The Soviet Union's vast backwardness in the civilian-industrial sector is caused by the system. As the armaments economy is set aside, its technical innovations have a hard time penetrating the civilian sector. There also is a lack of specialists for converting such new technology to civilian production. Conspicuous is that for their civilian industry the Soviets do not get the most up-to-date western technology, even when it is freely available, and rather prefer what has stood up well in the past. The upshot: The importance of the transfer of technology from west to east--apart from the military-strategic commodities--is vastly overrated.

The same applies to all other embargoes, unless all supplying countries take part in them and stick to them and the barriers cannot be circumvented. Both of that is pure theory. The grain embargo, for instance, which President Carter imposed against the Soviet Union in 1980, was a fiasco, so that his successor Reagan had to lift it again.

But why does the United States persist all the more now in toughening the provisions for exporting technical goods to the East Bloc? During the CoCom seminar of the Friedrich Ebert Foundation scientists and political and economic practitioners discussed that matter lengthily. It appears that in the United States there has been a very strong current since the 1920's that could best be called a "trade denial policy." This policy, more or less supported by any given administration, is rooted in a deep antipathy to anything that is communist. A Frankfurt industrialist reported from his own knowledge a typical detail: Managers of American multinationals normally get on shaky grounds as soon as they submit to doing business with the east. "It can easily happen that they get fired from one day to the next as Reds."

American big power politics is of course also unmistakably involved. While even the history of CoCom is explained by Europe's dependency on the United States during the Cold War in the 1950's, the 1960's likewise were marked by a strong economic supremacy of America, a supremacy which corroborates the stronger. Europe was nothing to be afraid of, Europe was a market for American products. Not until the 1970's did the Europeans gain a greater degree of independence, not last because of the greater economic strength of the FRG, with its own effects on trade relations with the east.

Through their new CoCom policy the Americans now are applying a lever for making Europe more dependent again. The national export legislation of the Americans has long surpassed what CoCom practiced thus far. If U.S. regulations were to be taken over into the CoCom rules, Berlin Professor Hanns D. Jacobsen predicts that the export of all ticklish goods "in computer technology, software, telecommunications, microelectronics, and fiber optics gets cut back or completely cut out."

Meanwhile we have come to the point where even computer parts are to go onto the index which are hardly made in the west any longer. The new CoCom list must be presented by the summer of next year. The European partners, however, have already promised the Americans they would place the embargoed goods about which they agree on the embargo list directly, without waiting for the conclusion of the overall revision. This anticipatory arrangement is a concession to the Reagan administration; it does not cost the Europeans much and is regarded as "cosmetic" by German negotiators.

The Americans evidently are serious about their tough eastern trade policy--on the whole as in detail. In May this year Pentagon Director Richard Perle publicly demanded CoCom provisions should be toughened and the Committee should be aligned organizationally. He wants to raise the \$ 500,000 budget to several million dollars. CoCom should no longer be an appendix to the U.S. Embassy in Paris, it should have its own building and a general secretary of its own. The time also had come to equip the office with the proper technology--with computers. Perle could not comprehend that the Paris CoCom center did not even have a photocopier.

Moreover, the Pentagon thinks it is a disadvantage for CoCom not to be formally tied to NATO. Thus far officers may attend meetings only from case to case. Security director Perle would now like to offer the general secretary a military commission which is to have the most important say in matters of strategy.

It is not only a matter of expanding the list of strategically important goods in Paris. The Americans are also asking for an export ban for products in energy technology--a demand that is hardly acceptable to the Europeans. Nor is there any logic to it. Early in 1980 the Americans had still supported the European natural gas pipeline business with the Soviet Union. The common idea was to temper the Soviet thrust toward the Persian Gulf oil sources by extracting, with western assistance, Siberian energy sources.

But in 1982 the Americans made an about-face and curbed the export of equipment needed for energy extraction. The export ban of June 1982 did not apply to CoCom, to be sure, yet it did apply to license contracts between American and foreign firms. For the AEG in Germany it would have meant the loss of a large order at a value of DM 650 million. Since the Americans lifted the export ban again early in 1983, AEG could carry on. For the approaching revision of the CoCom lists the Europeans now fear a new edition of this painful theme. Even during the natural gas pipeline business the Americans had made it clear that they would extend, if necessary, their national export control policy, which is more restrictive than that of CoCom in the first place, to American licensees and foreign subsidiaries of U.S. multinationals.

The Europeans are not likely to make it through these negotiations without offering concessions to the Americans. The Kohl government, to be sure, announced it would "fully support" the CoCom revision for the sake of common security, but internally a guideline was issued to engage only, if possible, in "cosmetics." That is not likely to do much good against the U.S. hawks, unless Europe is ready to accept a West versus West trade conflict.

Does this threaten the technical exchange within the western world? Here and there, that is virtually already the case. U.S. scientists who wanted to go to Karlsruhe in July for an international conference on artificial intelligence did not get the permission to speak there from the U.S. Defense Department. But since 70 percent of all public research funds in the United States comes from the Pentagon and up to two-thirds of all U.S. scientists work at least part-time for the defense establishment, the military already have a mighty influence on the transfer of technology between America and Western Europe. Another instance: A department of the nuclear research installation of Juelich had ordered certain laser equipment from the U.S. firm Honeywell. The delivery was refused for reasons unknown. The Americans seem to distrust their allies on this side of the Atlantic very much. Heinrich Vogel of the Federal Institute for Eastern and International Scientific Studies predicts hard times for the Europeans: They were going to be pilloried, as it were, on the export control lists. Bundestag deputy Ulrich Steger, a frequent guest in the United States, confirms it: "The United States is becoming an unreliable supplier." But then he turns the approaching trouble into a virtue: "Europe will have to develop more on its own terms and get by without U.S. technology."

A success of Soviet industrial espionage: At the U.S. Atlantic coast these Soviet underwater sonar devices were found with microelectronic components copying U.S. models [Photo not reproduced, although included in article]

#### The Arrogance of the Pentagon

[Article by Ulrich Schiller]

For 7 years William A. Root had been the director of the East-West trade department in the U.S. State Department. In September he resigned. His reason: Instead of negotiating with the allies about the upcoming revision of the CoCom lists in the manner in which President Reagan had promised it, in the spirit of compromise, that is, the United States had made them understand, with excess eagerness, that the Americans knew everything best and the allies should follow in their footsteps.

In a WASHINGTON POST interview, William Root identified the bugaboos in the Defense Department. The Pentagon had refused to depart even an iota from its own designs. It had not even considered any constructive proposals by the allies on more effective export controls. Root accuses the top echelon in particular of arrogance in dealing with the NATO friends: Secretary of Defense Caspar Weinberger, his state secretary for political affairs, Fred Ikle, and Director Richard Perle, responsible for international security.

Perle denies these accusations. The Reagan administration had merely corrected dangerous errors and omissions. In the 1970's, technical goods streaming illegally from west to east had caused devastating damage.

Indeed, one of the basic convictions of the Reagan administration from the outset had been to make eastern trade conform more with western security interests. Already in his first annual report to Congress in February 1982, Weinberger spoke of the Soviet Union's assault against the technical base of the west, a campaign by legal and illegal means. "The laissez-faire posture of the last decade," so said the Secretary, "has helped the Soviet Union in developing new generations of smart weapons, in dramatically improving its paratroop capacity, in making its nuclear weapons surer of aim, and the command control system of its armed forces, more effective through better computers." Acquiring western computers, integrated circuits and control systems, western know-how in semiconductors, general technology and supersynthetics--all that had saved the Soviet Union in production sectors of high military use billions of rubles and years in research.

The Pentagon has examples to offer:

--To the Soviet Kama truck plant built in the 1970's, West European countries had supplied equipment and technical know-how at a clip of \$ 1.5 billion. With all the Soviet promises that the trucks should serve civilian purposes exclusively, trucks from the Kama plant were used by Soviet troops in the GDR as well as in the invasion of Afghanistan.

--In the early 1970's the Soviet Union bought 160 precision tool grinders in the United States. With their help they were in the position to make ball bearings used for the ICBM's and the electronic timing devices for the nuclear warheads. The targeting precision of Soviet missiles has been accomplished this way much earlier than the Soviet technicians could have accomplished it on their own.

--In the late 1970's the Soviet Union bought two floating dry docks in the west. They were immediately assigned to the Red Fleets in the Pacific and the Arctic. These docks are the only ones that can accommodate not only the Kiev class of aircraft carriers but even the planned large-size carriers for the most modern fighter bombers.

--From England, France and Finland the Soviet Union acquired a modern technique for landing ramps between ship and pier or coast. Tanks and other heavy equipment can much faster be put ashore thereby than before. The latest ship for amphibious warfare, "Ivan Rogov," is said already to have been equipped with it.

--Thanks to western microelectronics and computer technology, the Soviet lag behind comparable U.S. technology of between 10 and 12 years (by 1965) has been diminished to between 3 and 5 years at present.

They are convinced in the Pentagon that export controls were greatly neglected, especially during the 1970's, the decade of detente. The Reagan administration now has brought in the FBI, the CIA and customs for stopping, together with new defense department control posts, the illegal transport of technical goods to Warsaw Pact countries. Here lies one of the reasons why the Reagan administration has started quite some time ago to exercise more scrutiny also over the

export of technical goods to friendly, even allied industrial nations. Bureaucratic obstacles have been heightened--to the chagrin of the people working on those things. And national security, while the supreme precept, is not the only one. Added to that must be protectionism and a nationalistic leadership claim to technical fields.

The specialty metal clause Congress ratified 2 years ago is protectionistic in origin. Strategically important metals may not be imported in the United States, either raw or processed, if they are available there as well. Since all weapons consist more or less exclusively of specialty steels and metals, that law practically bans the import of military goods and any ancillary arms supplies. That was a fatal blow against all arms coproduction plans and joint standardization.

FRG Defense Minister Manfred Woerner, as much as the Bundestag defense commission, categorically announced arms export in the alliance could not be a one-way street. If the Americans failed to rescind that law, which incidentally came about under strong trade union influence, the Europeans would follow their own course entirely in the future.

Notably reticent, to put it mildly, the Americans have lately been in selling semiconductors (for modern automated computers), software computer programs, and laser technology. Here they are evidently more interested in keeping their technical lead. The computer software for reliability computations in air and space travel was delayed, and the Honeywell firm, it has been learned, is not yet ready to sell a novel laser gyrostatic compass. The engines for the European airbus, originally ordered from the Pratt-Whitney firm, were not delivered on schedule, allegedly because of capacity difficulties, so that eventually one decided to do without them entirely, which also led to the demise, incidentally, of a large order from Thailand.

They are still talking about whether and how the Europeans are to be drawn into further NASA programs, mainly in possibly building a space station. Is that a national American or an international program? The White House, it is said, favors an international, the Pentagon, a national solution. German space specialists already are making public noise about the Europeans possibly finding themselves compelled in the next decade to develop their own shuttle.

The Americans have been hard hit by that mainly France and Japan have so clearly outclassed them in the nuclear industry and that, in Cern, the Europeans have a research center that is nonpareil. Nothing like it is to be repeated in any other field. It is sometimes hard to understand that other industrial nations do not want to be left hanging or merely be reduced to an ancillary role. There are of course also prudent voices of warning to be heard, for instance out of the National Research Council of the U.S. National Academy of Sciences: Technical innovations should be created to the largest extent--with regard to security, of course--within the international trade system and through free competition.

Congress must soon decide whether the export control law that expires late in September is to be extended, renewed or supplemented. A complete renunciation of embargo provisions appears indicated. The natural gas pipeline disaster could thus repeat itself in a different form.

## TECHNOLOGY TRANSFER

### BRITISH, SWEDISH 'SCIENCE PARKS' LINK UNIVERSITIES, INDUSTRY

Stockholm KEMISK TIDSKRIFT in Swedish No 5 Apr 83 pp 10-11

[Article by Kenneth Leverbeck: "Science Parks: 'Greenhouses' for New Companies?"]

[Text] Science parks are all the rage now in the attempt to create new jobs and to develop new products. In these company "greenhouses" the ideas of technologists and researchers are to be developed. In Great Britain it is hoped that the science parks will save British industry.

Birmingham is located in the heart of England, in the country's large coal and iron district. With over 2 million inhabitants it is the second largest city in Great Britain. The economic crisis of the Western world has had an extra heavy impact here. With nearly five percent unemployment the authorities are forced to utilize every opportunity to turn the development around.

Great hopes are being placed in a recently inaugurated science park, Aston Science Park, a building resembling a railway station, divided into apartment-sized cubicles. Managing director Ian Herman describes the project:

"The city of Birmingham, as well as the Institute of Technology, Aston University and Lloyd's Bank, have invested 1 million pounds each for an initial phase in order to stimulate enterprise in the district."

Ian Herman wants technicians and researchers full of ideas to come here and get help to develop their products. They are to receive expert help from the university in solving their technical problems. Ian Herman is also proud to be able to offer a complete financial package to the "guests" in the park.

"We take care of daily routine tasks with our office service. We offer loans and arrange contacts with researchers at the university."

But the intent is not for them to be able to stay here forever," Ian Herman says.

"The companies have 3 years in which to make their products profitable. Then they have to look for new premises which offer room to expand."

If the company fails with its project, technically and above all financially, then it is simply goodbye," Ian Herman says.

"The science park has a profitability requirement which must be fulfilled within a reasonable period, at the same time as, naturally, we want to make room for new projects."

The idea for Aston Science Park was hatched by Professor Frederick Crawford, who was active at Stanford University in the United States for 20 years. That was where he gathered his experience, which then formed the basis for the design of Aston Science Park.

The Birmingham science park is not the first in Great Britain. Cambridge was first with the idea in 1970. Today it houses 25 companies employing 750 persons. It is hoped that within a few years there will be 2,000 persons. There are about a dozen science parks all over Great Britain today, operating in a manner similar to the one in Birmingham.

#### United States Precursor

The idea of science parks was developed in the United States more than 30 years ago. The best known park is probably Silicon Valley in California, today the world's center for microcomputer development.

The perhaps most successful science park of the United States is located in North Carolina. It is the so-called Research Triangle, tied to three universities in the state, as well as to University of Georgia. This was begun in 1959, but after just a couple of years few thought that Research Triangle would survive.

Project after project had to be scrapped. Rescue came when IBM, the Wellcome Foundation and the state authorities opened their eyes to the science park. Today Research Triangle employs about 20,000 persons in 50 companies.

There are about 15 science parks in California and 5.6 and 7 facilities, respectively, in Colorado, Maryland and Massachusetts.

Confidence in science parks has grown increasingly strong all over the world. In Japan new facilities are constantly being opened, and all over Western Europe countries are seeking their own forms of science parks in order create new jobs and get the countries back on their feet.

But there are warnings from the homeland of the science parks, the United States, against hoping that this will be a solution for solving the economic problems of crisis-affected nations. It may take up to 10 years for a science park to become economically viable. Experience also shows that four out of ten projects succeed. Of those, only one develops into a profitable company, which must finance all the failures.

The reason for this is that the researchers who are full of ideas and talent are not always equally good at marketing. Many small companies remain small for that reason.

#### Unknown in Sweden

In Sweden science parks have been an entirely unknown concept until quite recently, when the idea for a facility was born in Lund. It is a cooperation between Lund University, the municipality and the SUN [University-Business and Industry Cooperation] Foundation, with the objective of promoting cooperation between the university and business and industry.

The idea is for the science park to be given the form of a corporation, in which SUN is part-owner in conjunction with various companies, banks and other interested organizations. Nils Horjel, provincial governor of Malmöhus Province, hopes that the science park will become some sort of "midwife," helping to "deliver" economically viable projects.

But the project has already been the target of criticism. The opinion is that the construction of science parks is artificial. It ought to be simpler for a company to locate a certain project directly at a university department, instead of the university moving out to an industrial area outside Lund, one believes.

Furthermore, one warns against creating new organizations for activities which already exist today. According to Professor Hakan Westling, one also should not believe that there are any revolutionary ideas waiting on the researchers' shelves. In other words, it is not certain that a science park will stimulate ideas and create profitable new companies.

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## TECHNOLOGY TRANSFER

### PROGRESS CONTINUES ON LUND RESEARCH PARK

Stockholm SVENSKA DAGBLADET in Swedish 1 Oct 83 p 28

[Article by Per-Erik Landqvist: "Companies Lining up for Science Park; 300 Million Kronor Invested in Ideon"]

[Text] Lund--The Ideon Science Park in Lund--initially an investment in the 80-million class--can already be described as a success.

Not quite 4 months have passed since the groundbreaking by the provincial governor of Malmohus Province, Nils Horjel, among others. And already the companies are in principle lining up in order to move in.

"The development has surpassed the most optimistic predictions," Horjel says. "In addition to the six so-called incubators totalling 5,000 square meters which we completed this fall, we had to make a lightning-fast decision to build a special incubator profiled for chemical-biotechnical development work."

Nils Horjel is chairman of the SUN (University-Business and Industry Cooperation) Foundation. SUN will relatively soon be forced to raise its capital stock from 50,000 Kronor to 5 million. Six firms have already joined as shareholders, and the provincial governor anticipates that a total of about 20 will be tied to SUN.

A total of eight companies are ready to move into the science park. Half of them are so-called spin-off companies, in the biotechnical area, among others. Two development corporations are tied to ASEA and Gullfiber.

Within a little over 10 years the Lund science park will house about 30-40 companies with 1,000 researchers. Provincial governor Nils Horjel believes that in as little as 4 years 400 researchers will be in place.

The first construction phase includes 17,000 square meters of laboratory and office space.

The cost of the phase is estimated at 80-85 million Kronor.

The land measures about 10 hectares, and once completed the science park will have a 50,000 square meter floor area at a cost of approximately 300 million Kronor.

#### One Year Old

The idea for Ideon was hatched 1 year ago in order to stimulate small industry in southern Sweden.

In Malmohus province alone the present proportion of small companies is 38 percent. The 62 percent share of the major companies is rapidly shrinking.

In the last 7 years the giant Kockums shipyard reduced its personnel from 6,000 to 3,800 employees and will lay off or retire another 900 by 1985.

"Just as Smaland, we want to have smaller units. We can get them through Ideon," Horjel believes.

The eight companies which are moving into the first incubators at Ideon are Ericsson Radio System, Perstorp AB, ASEA, Gedevlop, Enpece, Fluidcarbon International, Bohlin Reologgi and Bioinvest.

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